

*Excellence in Electronics***TYPE  
CK5643**

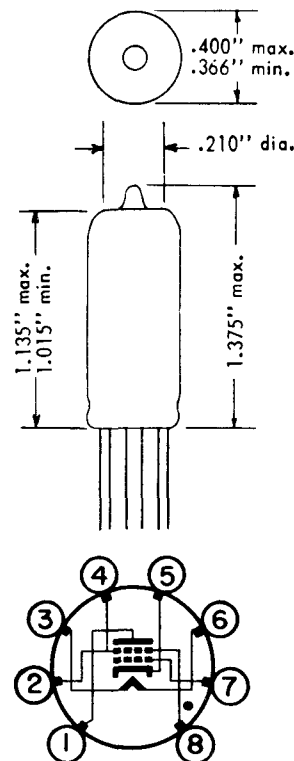
The CK5643 is a xenon tetrode thyatron of subminiature construction. This type is characterized by long life, stable performance and is suitable for service where severe conditions of mechanical shock or vibration are encountered. It is designed for use in counters, grid control rectifiers and other control circuits where freedom from early failures, long average life and uniform operating characteristics are required. The flexible terminal leads may be soldered or welded to the terminals of circuit components without the use of sockets. Standard subminiature sockets may be used by cutting the leads to a suitable length.

**MECHANICAL DATA**ENVELOPE: T-3 GlassBASE: Subminiature Button 8-Pin (0.017" tinned flexible leads  
Length: 1.5" min.)TERMINAL CONNECTIONS:

|                          |                          |
|--------------------------|--------------------------|
| Lead 1 Plate             | Lead 5 Cathode           |
| Lead 2 Grid #2 (Note 13) | Lead 6 Heater            |
| Lead 3 Heater            | Lead 7 Grid #1           |
| Lead 4 Grid #2 (Note 13) | Lead 8 Grid #2 (Note 13) |

MECHANICAL RATINGS:

|                                                                |        |
|----------------------------------------------------------------|--------|
| Maximum Impact Acceleration (Shock Test—Note 2)                | 450 G  |
| Maximum Uniform Acceleration (Centrifuge Test—Note 3)          | 1000 G |
| Maximum Vibrational Acceleration (96 hour Fatigue Test—Note 4) | 2.5 G  |
| Maximum Bulb Temperature                                       | 125 °C |

MOUNTING POSITION: Any

BOTTOM VIEW

8DD

**ELECTRICAL DATA**

CAUTION----- To Electronic Equipment Design Engineers: Special Attention should be given to the temperature at which the tubes are to be operated. Reliability will be seriously impaired if maximum bulb temperature is exceeded. The life expectancy may be reduced if conditions other than those specified for life test are imposed on the tube and will be reduced appreciably if absolute ratings are exceeded. Both reliability and performance will be jeopardized if filament voltage ratings are exceeded. Life and reliability of performance are closely related to the degree that regulation of the heater voltage is maintained at its center rated value.

**RATINGS AND  
NORMAL OPERATION:**

|                             | MIL - E - 1<br>SYMBOL | ABSOLUTE<br>MINIMUM | NORMAL<br>TEST<br>CONDITIONS<br>(Note 6) | NORMAL<br>OPERATION<br>(Note 5) | ABSOLUTE<br>MAXIMUM | MIL - E - 1<br>UNITS |
|-----------------------------|-----------------------|---------------------|------------------------------------------|---------------------------------|---------------------|----------------------|
| Heater Voltage (Note 7)     | Ef:                   | 6.0                 | 6.3                                      | 6.3                             | 6.6                 | V                    |
| Peak Forward Anode Voltage  | epy:                  | ----                | ----                                     | ----                            | 500                 | v                    |
| Peak Inverse Anode Voltage  | epx:                  | ----                | ----                                     | ----                            | 500                 | v                    |
| Grid #1 Voltage             | Ec1:                  | -200                | ----                                     | ----                            | ----                | Vdc                  |
| Grid #2 Voltage             | Ec2:                  | -100                | 0                                        | 0                               | ----                | Vdc                  |
| Heater - Cathode Voltage    | Ehk:                  | -100                | 0                                        | 0                               | +25                 | Vdc                  |
| Cathode Conditioning Time   | tk:                   | 10                  | ----                                     | ----                            | ----                | sec.                 |
| Peak Plate Current          | ib:                   | ----                | ----                                     | ----                            | 100                 | ma                   |
| Cathode Current             | lk:                   | ----                | ----                                     | ----                            | 16                  | mAdc                 |
| Ambient Temperature         | TA:                   | -55                 | ----                                     | 25±5                            | +90                 | °C                   |
| Anode Voltage               | Ep:                   | ----                | ----                                     | 150                             | ----                | Vac                  |
| Grid #1 Voltage (Note 8)    | Eg1:                  | ----                | ----                                     | 5.0                             | ----                | Vac                  |
| Peak Grid #1 Signal Voltage | eg1:                  | ----                | ----                                     | 5.0                             | ----                | v                    |
| Anode Resistor              | Rp:                   | ----                | ----                                     | 3750                            | ----                | ohms                 |
| Grid #1 Resistance          | Rg1:                  | ----                | ----                                     | 1.0                             | 10.0                | Meg.                 |

Tentative Data

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## RELIABLE XENON TETRODE THYRATRON

## ELECTRICAL DATA (cont'd)

| CHARACTERISTICS AND QUALITY CONTROL TESTS (Note 1)        |                                                                                                                                                                                                                                                                                                                                     |          |                       |      |      |       |      |      |      |                        |
|-----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-----------------------|------|------|-------|------|------|------|------------------------|
| TEST                                                      | CONDITIONS                                                                                                                                                                                                                                                                                                                          | AQL<br>% | MIL - E - 1<br>SYMBOL | MIN  | LAL  | BOGIE | UAL  | MAX  | ALD  | MIL - E - 1<br>UNITS   |
| <b>MEASUREMENTS ACCEPTANCE TESTS PART 1</b>               |                                                                                                                                                                                                                                                                                                                                     |          |                       |      |      |       |      |      |      |                        |
| Combined AQL = 1.0% Excluding Mechanical and Inoperatives |                                                                                                                                                                                                                                                                                                                                     |          |                       |      |      |       |      |      |      |                        |
| Heater Current :                                          |                                                                                                                                                                                                                                                                                                                                     | 0.65     | If :                  | 140  | 144  | 150   | 156  | 160  | 12   | mA                     |
| Heater - Cathode Leakage :                                | Ehk = +25 Vdc<br>Ehk = -100 Vdc                                                                                                                                                                                                                                                                                                     | 0.65     | { +Ihk :<br>-Ihk :    | ---- | ---- | ----  | ---- | 10   | ---- | $\mu$ Adc<br>$\mu$ Adc |
| Grid Voltage (1) :                                        | Epp = 350 Vac ;<br>Rg 1 = 0.1 Meg.<br>Rp = 10,000 ohms. (Note 9)                                                                                                                                                                                                                                                                    | 0.65     | Ecc 1 :               | -2.0 | ---- | ----  | ---- | -4.0 | ---- | Vdc                    |
| Grid Voltage (2) :                                        | Epp = 350 Vac ;<br>Rg 1 = 10 Meg. ;<br>Rp = 10,000 ohms. (Note 9)                                                                                                                                                                                                                                                                   | 0.65     | Ecc 1 :               | ---- | ---- | ----  | ---- | -6.0 | ---- | Vdc                    |
| Anode Voltage :                                           | Vary Ebb ;<br>Ec 1 = 0 Vdc ;<br>Rg 1 = 0.1 Meg. ;<br>Rp = 10,000 ohms. (Note 10)                                                                                                                                                                                                                                                    | 0.65     | Ebb :                 | ---- | ---- | ----  | ---- | 26   | ---- | Vdc                    |
| Continuity and Shorts (Inoperatives) :                    | (Note 11)                                                                                                                                                                                                                                                                                                                           | 0.4      | ----                  | ---- | ---- | ----  | ---- | ---- | ---- | ----                   |
| Mechanical :                                              | Envelope T-3 (8-1) (Note 12)                                                                                                                                                                                                                                                                                                        | ----     | ----                  | ---- | ---- | ----  | ---- | ---- | ---- | ----                   |
| <b>MEASUREMENTS ACCEPTANCE TESTS PART 2</b>               |                                                                                                                                                                                                                                                                                                                                     |          |                       |      |      |       |      |      |      |                        |
| Pulse Emission :                                          | epy = egy 1 = egy 2 = 180 $\pm$ 9 v ;<br>tp = 5 $\pm$ 0.25 $\mu$ sec. ;<br>tr = 0.5 $\mu$ sec. max. ;<br>tf = 1.0 $\mu$ sec. max. ;<br>Prr = 120 $\pm$ 5 ; tk = 5 minimum ;<br>Ra = 150 $\pm$ 5 % noninductive ;<br>Rp = 100 $\pm$ 5 % noninductive ;<br>Calibrating Resistor = 50 $\pm$ 5 % noninductive ; Zo = 75 ;<br>t = 3 max. | 2.5      | etd :                 | ---- | ---- | ----  | ---- | 76   | ---- | v                      |
| Vibration :                                               | No Voltage ; F variable from 10-50 cps ; G max. = 10 ;<br>Fixed amplitude 0.040 inch ;<br>Post Shock and Fatigue Test End Points Apply                                                                                                                                                                                              | 10.0     | ----                  | ---- | ---- | ----  | ---- | ---- | ---- | ----                   |
| <b>DEGRATION RATE ACCEPTANCE TESTS</b>                    |                                                                                                                                                                                                                                                                                                                                     |          |                       |      |      |       |      |      |      |                        |
| Subminiature Lead Fatigue :                               |                                                                                                                                                                                                                                                                                                                                     | 2.5      | ----                  | 4.0  | ---- | ----  | ---- | ---- | ---- | arcs                   |
| Shock :                                                   | Hammer Angle = 30° (Note 2)                                                                                                                                                                                                                                                                                                         | 20       | ----                  | ---- | ---- | ----  | ---- | ---- | ---- | ----                   |
| Fatigue :                                                 | 96 hours ; G = 2.5 ; Fixed Frequency f = 25 min., 60 max. (Note 4)                                                                                                                                                                                                                                                                  | 6.5      | ----                  | ---- | ---- | ----  | ---- | ---- | ---- | ----                   |
| Post Shock and Fatigue Test End Points :                  |                                                                                                                                                                                                                                                                                                                                     |          |                       |      |      |       |      |      |      |                        |
| Heater - Cathode Leakage :                                | Ehk = + 25 Vdc<br>Ehk = -100 Vdc                                                                                                                                                                                                                                                                                                    | ----     | Ihk :                 | ---- | ---- | ----  | ---- | 20   | ---- | $\mu$ Adc<br>$\mu$ Adc |
| Anode Voltage :                                           |                                                                                                                                                                                                                                                                                                                                     | ----     | Ebb :                 | ---- | ---- | ----  | ---- | 26   | ---- | Vdc                    |
| Glass Strain :                                            |                                                                                                                                                                                                                                                                                                                                     | 6.5      | ----                  | ---- | ---- | ----  | ---- | ---- | ---- | ----                   |
| <b>ACCEPTANCE LIFE TESTS</b>                              |                                                                                                                                                                                                                                                                                                                                     |          |                       |      |      |       |      |      |      |                        |
| Heater Cycling :                                          | Es = 7.0 V ; Eb = Ec 1 = Ec 2 = 0V ;<br>Ehk = 18 Vac ; 1 min. on, 4 min. off                                                                                                                                                                                                                                                        | 2.5      | Hcy :                 | 2500 | ---- | ----  | ---- | ---- | ---- | cycle s                |
| 100 Hour Survival Rate Life Test Conditions :             | Ib = 16 mA dc ; ib = 100 ma ;<br>Rg 1 = 0.05 Meg. ; Epp = 350 Vac ;<br>EHK = -100, + 25 Vdc ;<br>Rp = 5000 ohms ; TA = Room                                                                                                                                                                                                         |          |                       |      |      |       |      |      |      |                        |

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## RELIABLE XENON TETRODE THYRATRON

## ELECTRICAL DATA (cont'd)

| CHARACTERISTICS AND QUALITY CONTROL TESTS (Note 1) (cont'd) |                                                                                          |          |                       |      |      |                      |                                                        |                     |
|-------------------------------------------------------------|------------------------------------------------------------------------------------------|----------|-----------------------|------|------|----------------------|--------------------------------------------------------|---------------------|
| TEST                                                        | CONDITIONS                                                                               | AQL<br>% | MIL - E - 1<br>SYMBOL | MIN  | MAX  | MIL - E - 1<br>UNITS | Allowable Defects<br>per Characteristics<br>1st Sample | Combined<br>Samples |
| <b>ACCEPTANCE LIFE TESTS (cont'd)</b>                       |                                                                                          |          |                       |      |      |                      |                                                        |                     |
| 100 Hour Survival Rate<br>Life Test End Points:             | (Typical Sample Size<br>= 200 tubes)                                                     |          |                       |      |      |                      |                                                        |                     |
| Continuity and Shorts<br>(Inoperatives)                     |                                                                                          | 0.65     | ----                  | ---- | ---- | ----                 | ----                                                   | ----                |
| 500 Hour Intermittent Life<br>Test Conditions:              | Survival Rate Life Test<br>Conditions T Bulb = 125 °C<br>tk = 10 sec max. (Notes 14, 15) | ----     | ----                  | ---- | ---- | ----                 | ----                                                   | ----                |
| 500 Hour Intermittent Life<br>Test End Points:              | (Typical Sample Size = 20 tubes -<br>1st sample; 40 tubes 2nd sample)                    | ----     | ----                  | ---- | ---- | ----                 | ----                                                   | ----                |
| Inoperatives:                                               | (Note 11)                                                                                | ----     | ----                  | ---- | ---- | ----                 | 1                                                      | 3                   |
| Heater Current:                                             |                                                                                          | ----     | If:                   | 138  | 164  | mA                   | 2                                                      | 5                   |
| Grid Voltage (1):                                           |                                                                                          | ----     | Ecc 1:                | -0.8 | -5.0 | Vdc                  | 1                                                      | 3                   |
| Anode Voltage:                                              |                                                                                          | ----     | Ebb:                  | ---- | 70   | Vdc                  | 1                                                      | 3                   |
| Pulse Emission:                                             |                                                                                          | ----     | etd:                  | ---- | 100  | v                    | 2                                                      | 5                   |
| Heater-Cathode<br>Leakage:                                  | Ehk = + 25 Vdc<br>Ehk = -100 Vdc                                                         | ----     | lhk:                  | ---- | 20   | μAdc                 | 2                                                      | 5                   |
|                                                             |                                                                                          | ----     | lhk:                  | ---- | 20   | μAdc                 |                                                        |                     |
| Total Defectives:                                           |                                                                                          | ----     | ----                  | ---- | ---- | ----                 | 4                                                      | 8                   |
| 1000 Hour High Temperature<br>Information Life Test:        | Same conditions as 500<br>Hour Intermittent Life<br>Test. Limits not established.        |          |                       |      |      |                      |                                                        |                     |

- Note 1 Characteristics, Quality Control Test Procedures, and Inspection Levels are made according to the appropriate paragraphs of MIL - E - 1 "Inspection Instruction for Electron Tubes" and MIL - STD - 105A.
- Note 2 Test conditions and acceptance criteria per Shock Test Procedures of MIL - E - 1 basic specification.
- Note 3 Centrifuge Test with forces applied in any direction.
- Note 4 Test Conditions and Acceptance Criteria per Fatigue Test Procedures of MIL - E - 1 basic specifications.
- Note 5 These normal values represent conditions at which control of reliability may be expected.
- Note 6 These normal test conditions are used for all characteristic tests unless other wise stated under the individual test item .
- Note 7 For most applications the performance will not be adversely affected by  $\pm 5\%$  heater voltage variation, but when the application can provide a closer control of heater voltage, an improvement in reliability will be realized.
- Note 8 Bias voltage, 180° out of phase with anode voltage.
- Note 9 Under the conditions specified, the control-grid voltage shall be changed in a positive direction until the tube starts to conduct current. The grid voltage measured at the grid voltage supply required to cause conduction shall be within the limits specified.
- Note 10 Under the conditions specified, the anode voltage shall be increased until the tube starts to conduct current. The anode voltage required to cause conduction shall be within the limits specified.
- Note 11 The last sentence of paragraph 4. 7. 5. shall not apply.
- Note 12 In addition to meeting the tightened electrical, physical and mechanical tests described in this data sheet, Raytheon Reliable Tubes are now guaranteed to be free from "potential" defects identifiable by microscopic inspection as described by appendix B of Inspection Instructions for Electron Tubes.
- Note 13 The Grid #2 shall not be used for control purposes.
- Note 14 Phase of grid voltage shall be adjusted to provide start of conduction at the peak.
- Note 15 The heater-cathode voltage shall be cycled 30 seconds positive and 30 seconds negative.

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